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AMERICA'S MYSTERY LAND

BY ROBERT P. CRAWFORD

UNIVERSITY OF NEBRASKA



NEW MEXICO is yielding a rich harvest of relics of prehistoric pueblo life and culture. Exploration has brought to light a wealth of material—artistic and useful—all eloquent of the daily life of an intelligent people that flourished in that region in a remote past. Reading the following pages and visiting the museum at Santa Fé is like reading Bulwer's "Last Days of Pompeii" and then inspecting the antiquities in the National Museum at Naples.



Photo by George L. Beam, Denver, Colo.

RELICS FOUND IN A CLIFF DWELLING

These specimens are fair representations of the interesting relics of prehistoric life that have been brought to light during recent years in Colorado and New Mexico



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MUSEUM OF NEW MEXICO, SANTA FÉ, N. M.

This picturesque building contains the collection of prehistoric remains that have been unearthed in the pueblo ruins of New Mexico



AMERICA'S MYSTERY LAND ❖ ❖

A Visit to New Mexico Pueblo Ruins Where
Relics of Prehistoric Life Have Been Excavated

BY ROBERT P. CRAWFORD

Morning found me in the enchanted land. The night before the express had thundered out of Kansas and Colorado and under the black cover of midnight had deposited me in New Mexico. But I might as well have awakened in Italy or Spain or Egypt. Morning in the capital city of Santa Fé had brought a scene where horses were almost as common as automobiles, cobblestones as brick pavements, and adobe houses as apartment houses in many another city.

New Mexico is indeed the Egypt of America. There is more mystery, enchantment and unusualness to the square foot of New Mexican soil than anywhere else. Egypt has been in the limelight of archæology for the last two or three years, but here in our own country, in New Mexico, there is quite as much romance and mystery.

It may seem strange to tell you that there are still plenty of frontiers in America. There are a great many places in our own Southwest which have



THE PUYÉ RUINS, NORTHWEST OF SANTA FÉ

In its best days this pueblo had no less than 1,600 rooms—a community village in one structure

not been visited by more than a dozen or so parties of white people. At one schoolhouse in New Mexico the boys every Saturday go out and pick up archæological specimens more than one thousand years old, which many a museum would be glad to obtain. Only a short time ago the magnificent Carlsbad Cave in southeastern New Mexico was discovered and explored—the existence of which up to that time had been known to only a few people.

So here we draw back the curtain of our own civilization for one thousand or two thousand years. Much of the mystery, the romance and the picturesque of New Mexico have centered around the Pueblo Indians, plus the ruins of a prehistoric people stretching across the Southwest.

Many travelers who have seen one or more of these ruins have often speculated as to what strange prehistoric races once inhabited our Southwest. But now comes modern-day science and establishes the fact that the Pueblos of the present day and the prehistoric races are closely related. Briefly, it is now believed that the builders of the great communal dwellings of a thousand or two thousand years ago were simply the ancestors of the present-day tribes that remain.

There are more than six hundred abandoned villages stretching from Colorado through New Mexico and into Utah, Arizona and Mexico! In northwestern New Mexico, not far from the junction of the four states Colorado, New Mexico, Arizona and Utah, is the Chaco Canyon. It is in this section of the state that the American Museum of Natural History and other

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organizations have been making explorations for several years. Across the Colorado border is the Mesa Verde National Park, with its famous cliff ruins; across the Arizona border is the Canyon de Chelly, and some distance away in Utah are the far-famed natural bridges.

Within the radius of thirty to seventy miles of Santa Fé, as the crow flies, are some of the most interesting examples of both prehistoric and modern pueblo community houses. First there is the Canyon of El Rito de los Frijoles, known also as the Bandelier National Monument. That is only half a day's ride by automobile from Santa Fé and is the most easily accessible of the important ruins. A little to the north are the Puyé ruins, while to the south of Frijoles is the Canyon de Cochiti, famed for its stone lions, remarkable specimens of aboriginal sculpture. The Pecos ruins are thirty miles southeast of Santa Fé. The modern-day pueblos, for the most part, begin with Taos (tah'-oce), famed by many artists and located in the north central part of the state, and swing down in a serpent-like trail to Isleta, south of Albuquerque. Generally it may be said that the northern part of the state contains the historic treasures.

El Morro National Monument, or Inscription Rock, is in the west central part of New Mexico near the Zuñi Indian reservation. Not far from here is Acoma; the sky pueblo. The newly discovered Carlsbad Cave is in the southeastern part of the state. In the southwest are the Gila cliff dwellings, also a national monument of extraordinary archæological interest.



TYU-ONYI, A COMMUNITY HOUSE OF SEVERAL HUNDRED ROOMS AT LOS FRIJOLES (pronounced free-hole'-cz)



EXCAVATED PORTION OF THE AZTEC RUIN IN NORTHWEST NEW MEXICO

The Chaco Canyon, now a national monument, has offered one of the greatest fields for the archæological explorer. "Of all the peoples of the ancient world whose achievements have survived the ages, none have more completely attained oblivion," according to Dr. Edgar L. Hewett of the Museum of New Mexico. Many, many years ago explorers went out over the New Mexican desert to this canyon, which up and down its length boasts not one but a dozen or so individual ruins. The difficulties of the early explorers are not to be minimized. There were then no automobiles to lessen the hazards of desert traveling, and it was several days' travel by pack train to the scene of operations. The National Geographic Society has embarked on a five-year program of research on the ruins of Pueblo Bonito and Pueblo del Arroyo, while the School of American Research at Santa Fé has a permit from the government for work on the ruins of Chetro Kettle and Casa Rinconada.

Chaco Canyon is one of the remarkable archæological features of New Mexico. It is fifty miles from a flowing stream of water. To venture out on this part of the desert on horseback, as in the old days, without a Navaho guide was dangerous indeed, for he only knew where the springs of water were located. Even then it might take days of riding to reach one. Hot sands and dust storms were always the rule in this part of the country.

Here one comes suddenly upon this canyon, once the home of myriads of people but to-day entirely forgotten except by a few scientists. The Pueblos who lived in the Chaco Canyon in bygone ages did not require all of their energy for their material needs. So they had time to construct great ceremonial chambers and architectural monuments which have been likened by some explorers to the work of the European cathedral builders

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in the Middle Ages, and in ceramics or pottery, which apparently reached its greatest development at Chaco Canyon. The black and white ware of the Chaco Canyon has been cited by some as marking the acme of that art in the Southwest.

It has long been the custom with historians and illustrators to picture the arduous task of erecting the pyramids of Egypt and the structures of ancient Greece and Rome. But here in the New World there was a problem equally great. Long before the white men came to America these prehistoric people of the Southwest were learning to build great communal structures. It is estimated that in the construction of Chettro Kettle, one of the ruins in the Chaco Canyon, more than 50,000,000 pieces of stone were quarried, transported, shaped and laid in walls. Thousands of logs for poles had to be hewn in distant forests and transported by hand to the building. This was only one of twelve large communities in the Chaco Canyon, besides a number of small villages in the seven miles of the canyon.

"It was no unwilling task under the lash of kingly taskmasters," declares Dr. Edgar L. Hewett, the director of the Museum of New Mexico. "The American Indians were never so ruled. It was the spontaneous, perhaps intuitive, industry of a strong people, comparable to the heaping up of mounds in excess of actual needs by insect communities. It may indicate the operation of an important organic law. Similar happenings were the building of the earth mounds of the Mississippi Valley, the pyramids of Egypt and of Mexico, the great wall of China and the European cathedrals of the Middle Ages. A parallel to it is seen in the present-day accumulation



THE STONE LIONS OF COCHITO, N. M.

These figures are said to be the oldest specimens of stone sculpture in the United States



RUINS AT LOS FRIJOLES, NEW MEXICO

In the Los Frijoles Canyon there are houses built on the floor of the valley and hundreds carved out of the cliff itself

of wealth, which goes on far beyond the needs or possible uses of owners, a characteristic of our commercial age, which is being lived as unconsciously by the majority of people, so far as its real meaning is concerned, as was the building age of the aboriginal Americans in their time."

The actual exploration of these ruins is by no means as romantic as it may sound. Before the days of automobiles it meant long, tiresome journeys over the New Mexican desert and camping miles from nowhere. For the more ambitious of the excavations small railroads may be built with push cars in which the débris is hauled away. For other smaller excavations, where only a few men are working, it is more or less a hand job. In recent years there has been quite a change in the manner of excavations. A quarter of a century ago, when Pueblo Bonito was excavated by the Hyde Exploring Expedition, it was the custom to fill up the ruins as fast as they were excavated and the treasures had been removed. The modern-day plan is to clear the ruins of débris and keep them from further disintegration.

For several years the American Museum of Natural History has carried on work at Aztec, N. M., some sixty miles from the Chaco Canyon. The Aztec pueblo was built in the form of the letter "E," some 280 by 360 feet in size. Sandstone blocks, which with cobblestones, adobe and iron concretions were used in the construction, were cut out and laid with a great deal of skill. These sandstone blocks were transported from the quarries two to



CEREMONIAL CAVE, NEW MEXICO, VIEWED FROM ACROSS THE CANYON

This picture shows a party ascending the canyon's walls to view the enchantment of Ceremonial Cave. The cave is situated in the Bandelier National Monument, Los Frijoles Canyon, New Mexico

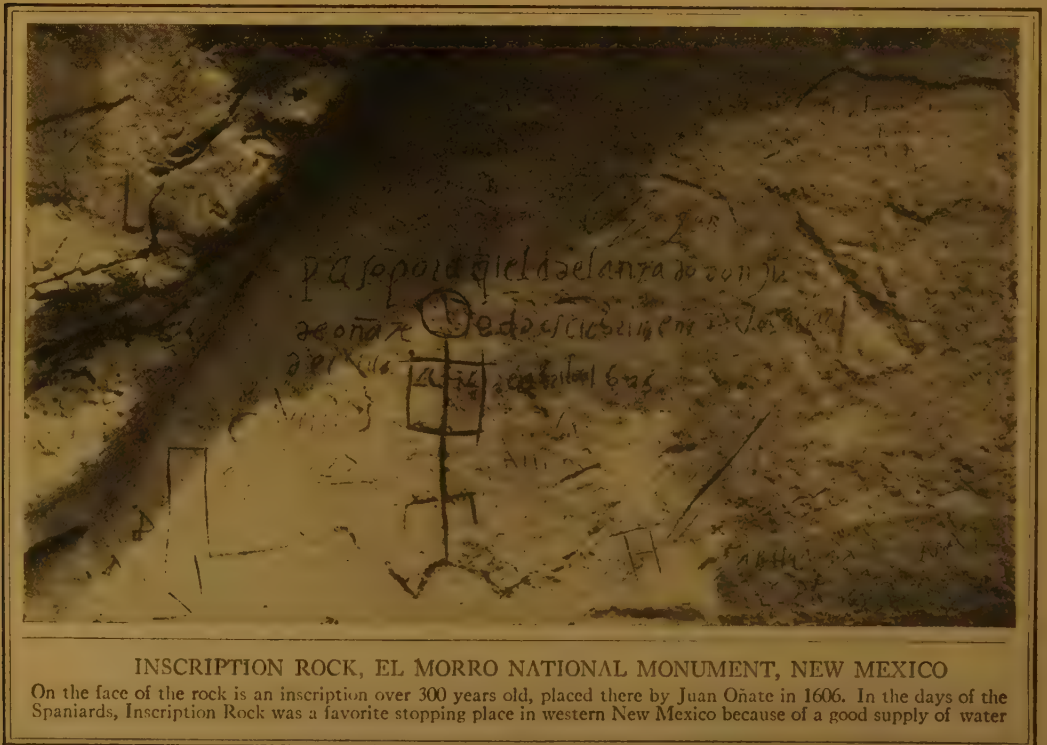
AMERICA'S MYSTERY LAND

five miles by human means, since the Pueblos did not use beasts of burden.

A room of strikingly beautiful design was uncovered a couple of years ago. The interior had been painted in white, surmounted with red borders in triangular design. A sacred serpent had been carved in wood in the ceiling and there was a stone altar. As one might readily guess, this was a kiva, or ceremonial room for religious purposes. Here the Pueblos carried on their sacred rites. First they located the sanctuary and then built their living-rooms around it. In another room in the Aztec ruins the body of an individual with a broken arm was discovered. Here six splints of wood had been applied by the native doctors to hold it in place.

Perhaps the most interesting feature of all this work is the manner in which explorers determine the relative age of the different ruins. It often happens that several successive pueblo civilizations are represented in a single spot, each built on top of the other. What the explorers do is to find a junk heap, where the Indians were accustomed to throw away all of their broken pottery. They simply dig a shaft down through the heap and there all the successive stages of civilization are revealed. Pottery by its colorings and characteristics represents the different civilizations of these prehistoric peoples, and in that way the comparative age of the different ruins may be determined.

It remained for Prof. A. E. Douglass of the University of Arizona to invent an entirely new system of measuring comparative age. He discovered





Courtesy of Dr. J. W. Fewkes

PREHISTORIC POTTERY FROM THE MIM-
BRES VALLEY, NEW MEXICO

The rainbow is personified as a measuring worm

tively restricted area. In this way Professor Douglass was able to demonstrate that Pueblo Bonito, in the Chaco Canyon, had been built some thirty to fifty years earlier than Aztec.

It is now quite generally agreed that these Indian ruins are not, for the most part, as old as some people have declared them to be. Many of them are prehistoric because they antedate any accurate knowledge of history, and because they were built long before white men set foot on the continent. But that does not mean that they antedate the ruins of Greece and Rome. Probably one thousand to two thousand years ago will include all of the oldest ruins which are generally known in New Mexico. Civilization at the Mesa Verde cliff ruins in southern Colorado reached its height about 1300 A. D.

The Canyon El Rito de los Frijoles, and near-by ruins, a half day's automobile ride from Santa Fé, is naturally one of the popular places that the casual visitor to New Mexico is most likely to see. On the floor of

that in the beams found in the ruins of Pueblo Bonito and in the Aztec ruins, some sixty miles away, the years are recorded by means of the growth rings of the original tree trunks. The climatic changes of certain years are recorded in the width of the tree rings. Of course it must be understood that the trees which formed beams for the different ruins were growing in the same section of the country, and so climatic changes from year to year would be impressed on them. This furnishes an excellent way of determining the relative age of different ruins found in a compara-



HOW THE AGE OF RELICS IS DE-
TERMINED

The Pueblo Indians were much like the people of the present day, in that they tossed their broken dishes out on a junk heap. The archaeologist digs a shaft down through this heap and by means of the pottery fragments gets a key to the age of the ruins



the valley are numerous ruins of prehistoric time, the most important of which is 'Tyu-onyi, a community house of several hundred rooms. Up and down this canyon are not only houses built in the shelter of some cliff, but hundreds actually carved out of the cliff itself. One of the most interesting features of this ruin is the ceremonial cave, or kiva, which has been restored to its original character. Near Los Frijoles are the stone lions of Cochiti, said to be the oldest specimens of stone sculpture in the United States.

The Puyé ruins are a little farther from Santa Fé in the same general direction as Los Frijoles. Puyé was the center of a population that radiated out over the Pajarito (pah-ya-rec'-to) plateau. In its best days this pueblo had somewhere around 1,600 rooms. There are numerous ruins of from two to fifty rooms near here.

It is here that the School of American Research has held many of its summer sessions. This school, which is operated in connection with the Museum of New Mexico, at Santa Fé, is a unique institution. Holding its classes, which are essentially of a laboratory character, at the various ruins,



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it aims to give the novice a practical initiation into archæological work. Naturally most of the students who go to Santa Fé to take up the work every summer are already college graduates, who probably know something of the theory but who lack the practical side. This school is the only institution of its kind.

The Pecos ruins, southeast of Santa Fé, are both prehistoric and historic ruins. Up to a short time ago this matter had been disputed. Some excavations recently made showed, when the rooms had been cleared, that there had been another pueblo, probably of prehistoric origin, on the same site. This pueblo was gradually vacated by its owners. In fact, some time after 1680, the entire upper wall of one part had caved in, burying all the rooms to the east of it.

New Mexico is a land of contrasts. Side by side with these ancient pueblos



A RECONSTRUCTED KIVA, OR CEREMONIAL CHAMBER
This photograph was taken at Los Frijoles Canyon, northwest of Santa Fé, N. M.

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are the modern pueblos, inhabited by the Pueblo Indians and famed principally for their pottery and their various ritualistic festivals. Perhaps the most famous of these is Taos, in the northern part of the state. One section of this pueblo rises to a height of five stories, and has been likened to a pyramid. It is surrounded by an adobe wall with loopholes through which the Indians shot at the enemy in early days. Located some twenty-five miles from the nearest railroad, this pueblo is still somewhat primitive. It has become best known because of the artists who have taken up residence in the near-by town of Taos and have broadcast its charms to the world.

There are many modern pueblos stretching from Taos to Santa Fé. But not all of them by any means have come under the spell of civilization.

One of the most striking things about New Mexico is the way in which it is developing its historical and artistic resources. The crowning features of Santa Fé, the capital city of New Mexico, are the old Governor's Palace, housing the state's historical relics, and the new Museum of New Mexico, which is devoted almost exclusively to the work of artists who have painted pictures of the Southwest. This great building, erected in the Spanish style, is the center of the state's artistic life. It has proved of material assistance to many young and talented artists, not only by exhibiting their work, but in some cases going so far as to furnish them studios in which to work.



AUDITORIUM IN THE MUSEUM OF NEW MEXICO, SANTA FÉ, N. M.

The interior of this room was designed after the style of an old Mission, and interesting mural paintings are to be found on its walls

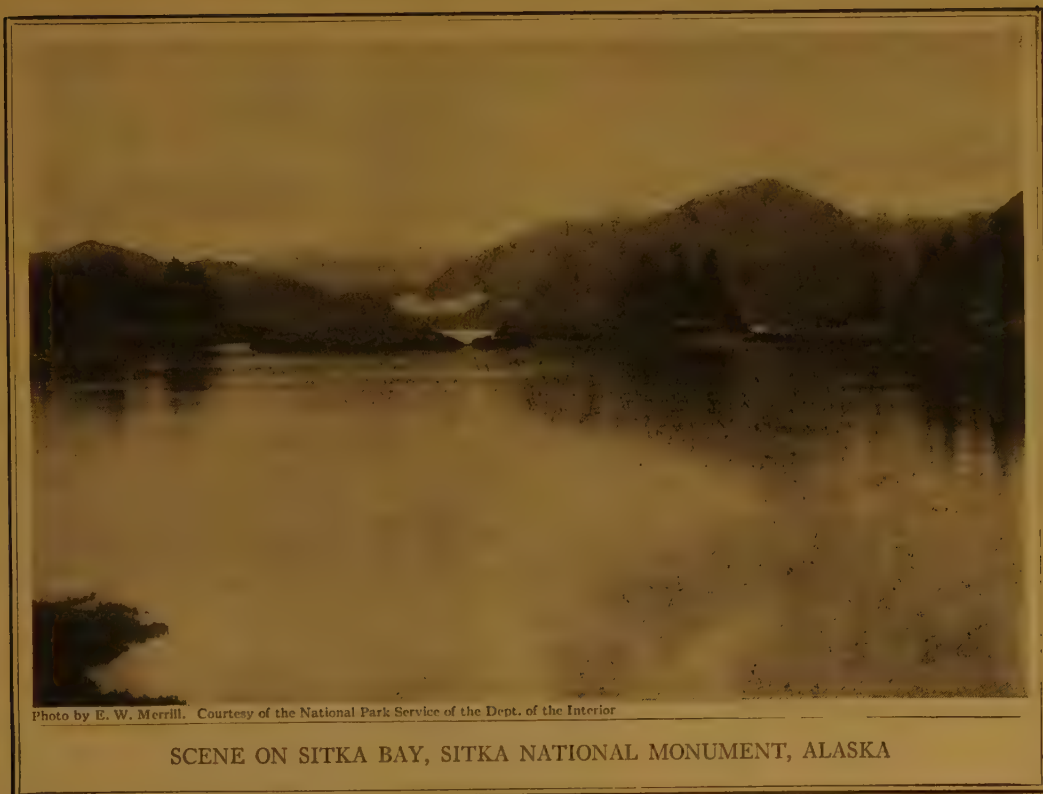


Photo by E. W. Merrill. Courtesy of the National Park Service of the Dept. of the Interior

SCENE ON SITKA BAY, SITKA NATIONAL MONUMENT, ALASKA



ERE ALASKA'S DESTINY WAS SET

Baranof Island, Ruled by Russia for Years, Now
Site of Uncle Sam's Sitka National Monument

BY ISABELLE FLORENCE STORY

In southeastern Alaska, on Baranof Island, lies the Sitka National Monument, an area of about fifty-seven acres, preserved by the United States Government to commemorate the spot where, over a century ago, Alaska's destiny was settled. On this spot, where an old village of their ancestors had been located, the Kik-Siti Indians in 1802, after defeating and massacring a contingent of Russians, fortified themselves and successfully withstood the attacks of the Russians and Aleuts under Baranof and Lisianski for many months. Finally, in 1804, the Russians won the decisive engagement known as "The Battle of Alaska," which resulted in the complete subjugation of the natives of southeastern Alaska to Russian rule and paved the way for the later purchase of the vast territory of Alaska by the United States. At that time the English were making efforts to secure the area, and had it not been for the Russian success at Sitka, Alaska to-day would probably be part of the British dominions. A clearing in the Monument, about 150 feet in diameter, is said to be the place where the natives had their

HERE ALASKA'S DESTINY WAS SET



Photo by E. W. Merrill. Courtesy of the National Park Service of the Dept. of the Interior

CASCADE IN INDIAN RIVER

One of the many scenes of wild forest beauty in Sitka National Monument,
Baranof Island, Alaska

stockade during the long siege.

To-day no signs of this momentous battle remain but the graves of a Russian midshipman and six Russian sailors killed in battle and buried where they fell. Even the signs of man's struggle with the elements are missing here. The Monument borders Sitka Bay, and its wide, graveled beaches and tide flats, meeting picturesque forests of spruce and hemlock, form a pleasing contrast to the precipitous mountains rising not far away, and to the rugged coast line that is common throughout the locality.

Near by is the town of Sitka, which is the port of call for steamships from Seattle. Travelers landing here pass through the old Russian custom house

with its walls of massive hewed logs, and on through the old ruined trading post, also a relic of the days of Russian dominance. Along the streets, selling baskets, moccasins and other handmade articles, sit many Indian women, young and old, descendants perhaps of the old Kik-Sitis who battled so bravely for their freedom in the early part of the nineteenth century. After leaving the town a walk of about a mile along the bay brings the traveler to the National Monument, where the road plunges at once into the shadow of the forests and winds through leafy passages with clearings here and there around some totem pole.

These totem poles, carved and decorated by the aboriginal Alaskans, are fascinating records of the past. To penetrate the meaning of their strange

carvings, however, one must know something of the history of the clan represented by each totem. Each of the early Alaskan clans had as their symbol some animal, which was carved on their family totem poles. To this were added carvings depicting and immortalizing historic events in the family life and the noble deeds of its members. Sitka's totem poles, the Alaskan "family trees," are among the very best existing work of the savage genealogists. The modern southeastern Alaskan Indians, believing this old Indian stronghold a fitting place to preserve these poles, presented them to the United States with the understanding that they would be properly preserved. And Uncle Sam is keeping faith with the donors by hav-



Photo by E. W. Merrill. Courtesy of the National Park Service of the Dept. of the Interior

TOTEM POLES, SITKA NATIONAL MONUMENT

These totem poles, carved and decorated by the aboriginal Alaskans, are fascinating records of the past. The modern southeastern Alaskan Indians, believing this old Indian stronghold a fitting place to preserve these poles, presented them to the United States, and Uncle Sam is protecting them and having the carvings restored by native workmen

ing the carvings restored by native workmen where vandalism has occurred and repainting them as nearly as possible in their original colors. Four of the poles, facing inward, have been placed at the corners of the old stockade site.

Another reminder of the early Indians is the "Witch Tree" that still stands in the Sitka Monument. To present-day Indians it is an object of deepest veneration and awe, for in its spreading shade their ancestors held their primitive trials of natives accused of practicing the art of witchcraft, and on this tree they hanged the luckless victims of their savagery.



Photo by E. W. Merrill. Courtesy of the National Park Service of the Dept. of the Interior

THE "WITCH TREE," SITKA NATIONAL MONUMENT

This old tree is an object of veneration and awe to the present-day Indians, for in its shade their ancestors held their savage trials for witchcraft and on it hanged their luckless victims



WHERE PREHISTORIC ANIMALS WERE TRAPPED IN TAR



HE PITS OF RANCHO LA BREA



Which Revealed to the Scientific World an Amazing Assortment of Prehistoric Animal Remains

BY RAY FROST

In the asphalt funnels of Rancho La Brea (Ranch of the Tar), lying six miles west of the center of Los Angeles, have been discovered the bones of an amazing assortment and number of prehistoric animals. Gigantic beasts, of species long extinct, stumbled into these pits of crude oil and sank to a long oblivion during the period of the Quaternary or Pleistocene, supposed to have been some time between 50,000 and 500,000 years ago.

Unlike most fossil discoveries, here the actual bones were found, preserved complete in their original form, and not replaced by lime or other foreign substances; and such of the skeletons as have been reassembled have been set up without restored parts.

Among the ponderous quadrupeds to fall victims to these sticky traps of asphaltic oil were a number of great mammoths, or imperial elephants, some of them armed with curving tusks sixteen feet in length and standing three feet taller than Jumbo. There were found the remains of a score of American mastodons; curious short-legged ground sloths as big as oxen; and innumerable camels, horses and bison, all of types that lived and disappeared before the period referred to by scientists as "recent times."

Of the carnivorous animals, probably attracted to the scene by the bellowing and struggles of the luckless grass eaters and hastening to devour

THE PITS OF RANCHO LA BREA

them, to become themselves victims of the sticky tar, there were over two thousand saber-toothed tigers, an even greater number of giant wolves, great cave bears and scores of lions much larger than any of the present day.

The amazingly effective traps that caught all these creatures probably resulted from a break in the formation far below the surface of the earth, releasing a pocket of gas that blew out the funnels in the clay and sand, to be followed from the depths by an oozing inflow of oil. When the oil had filled the craters to a level with the surrounding plain, evidently the flow weakened until it was about equal to the loss by evaporation, and for ages, except for a slow, gradual hardening of the contents, they must have remained unchanged. The lightly encrusted surface would soon have become covered with dust and leaves, hiding the treacherous nature of the oil pools.

Of the mammal remains discovered, there was an average of ten carnivorous animals to each of the herbivorous, probably a result of the gathering from far and wide of the flesh eaters when some unfortunate beast was caught in one of the sticky pitfalls.

It would be interesting to know just what sort of looking woman she was in life whose bones were found ten or a dozen feet below the surface of the hardened asphalt in one of the newer pits. One wonders under what circumstances her fate overtook her, and if she and her companions lived in constant fear of ferocious animals that may still have prowled that part of the earth.

She carried utensils in the form of two wooden paddles, and some bits of bone and shell, neatly perforated, that must have been articles of personal adornment. The skull, rather small for that of an adult, is well formed.



INTERIOR OF THE LOS ANGELES MUSEUM, CALIFORNIA

Showing collection of skeletons of prehistoric animals gathered from the pits of Rancho La Brea, California. The huge skeleton in the center is that of the mammoth, or imperial elephant, with the giant ground sloth in the right foreground.



SKELETON OF MASTODON, TAKEN FROM THE PITS OF RANCHO LA BREA
This gigantic animal was at one time common in all parts of the United States

Guesses as to the time of her falling into the oil pit—if she did fall in, and was not thrown in by someone with wicked designs—range from 10,000 to 25,000 years ago.

The bones of a great many carrion-feeding birds were found, among them numerous specimens of a giant condor called "Teratornis," supposed to have been the largest bird of flight that ever lived.

Mingled with the bones of various birds and mammals were those of a previously unknown peacock, which, to judge by the number of its remains, must have fallen an easy victim to the tar. The well-preserved skeletons of about sixty camels and about an equal number of horses, all of types older than those now living, were discovered in the pits. Both the camel and the horse are believed to have originated in this country, and to have become extinct here after the species had migrated to other lands by way of routes no longer existing.

The pits of La Brea occupy an area of about thirty acres and are separated for the greater part by thin walls of clay and sand. Usually they are from ten to thirty feet across at the top, tapering to a small inlet pipe at a depth varying from twelve to forty feet.

The collection of fossil remains from these pits, now exhibited at the Los Angeles Museum of History, Science and Art, is much the largest and best preserved in the world. Embedded in the oily sand and asphalt of the miniature craters the bones of these creatures have been hermetically sealed against the action of the elements since the time they sank beneath the surface of the tar.



IN THE BUFFALO PARK, BANFF, ALBERTA, CANADA



HE BUFFALO—LORD OF THE NORTH

No Longer a Dying Species—The Depleted Bison Population is Increasing Fast

BY AUBREY FULLERTON

There now seems to be little danger that the lordly American buffalo will become extinct. It was feared for a time that he was dying out, as other animal species have done. So recently as twenty years ago a published estimate put the number of living bison, sole relics of their kind, at not more than six hundred in all America; but to-day there are at least eleven thousand.

In the 50's and 60's the bison, which had once roamed the West, from Texas to the Saskatchewan River, in millions, were victims of on-sweeping settlement, which brought with it an orgy of ruthless and shameful hunting. The Texan herds were exterminated; the building of the railroads spelled doom also for the herds of the central and northern plains; and by 1890 the buffalo had been driven to a last stand in a few remote wilderness refuges. The killing was almost complete, and it seemed fair to assume that the species was about to disappear. Even yet the buffalo is frequently quoted as an example of what will happen to other native animals if we do not observe protective laws.

From the remnant of the one-time millions, however, a bison population has been successfully reconstructed. The "sole relics" were befriended by nature lovers and conservationists, foremost of whom were Ernest



Courtesy the Canadian Pacific R.R.

HIS MAJESTY, LORD OF THE NORTH

THE BUFFALO—LORD OF THE NORTH



Harold Baynes and Theodore Roosevelt, and through their efforts a "save-the-buffalo" campaign was inaugurated, money was raised and some animals were bought. The American Bison Society was organized to carry on the agitation in a more public and educational way, and for a number of years it did effective work. In response to these several appeals the United States Government set aside reservations in which the bison were given permanent

sanctuary, and there the rescued remnants were taken under public care. A similar policy was adopted in Canada.

It can now be said, after twenty-five years or so of international effort, that the buffalo has been saved; within smaller bounds than used to be he still keeps true to type.

In the United States five buffalo families are being maintained as wards of the nation. Yellowstone Park has the largest of these, a herd of about eight hundred head. The National Bison Range in Montana is next, with 675 head, and smaller herds are located in the Wind Cave National Park, South Dakota; the Sullys Hill Game Preserve, North Dakota, and the Niobrara Reservation, Nebraska. In all there are approximately seventeen hundred buffalo in these five parks.

Quite the greatest piece of bison-saving work is being done in the Canadian National Buffalo Park at Wainwright, Alberta, where close to eight thousand animals are in pound. The nucleus of this herd came from Montana in 1909, when the Dominion Government bought 641 head, at a price of \$250 each, from a rancher of that state who had taken up buffalo farming by way of diversion and found it more than he could manage. The animals were moved across the border to a newly es-



THE BUFFALO—LORD OF THE NORTH

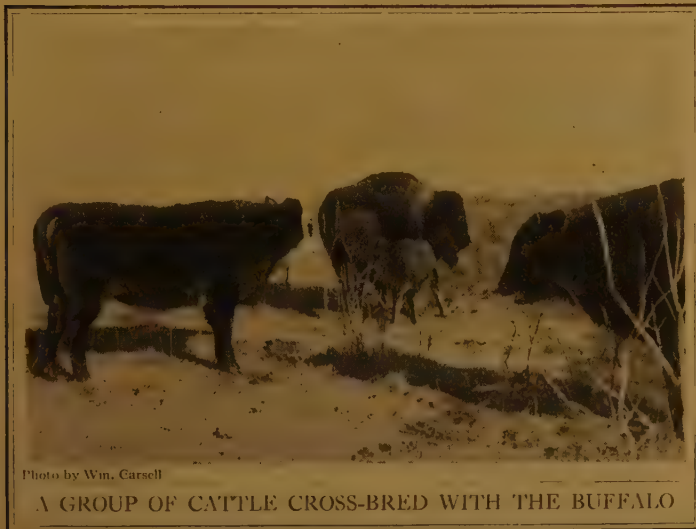
tablished reservation on the Alberta plains, and an additional eighty head were transferred from the Rocky Mountains Park at Banff. In their new quarters they were given the run of 160 square miles of rolling prairie, in which the conditions were precisely like those of the original wilderness except that a strong wire fence around their big playground kept them just short of complete freedom.

As an experiment in animal conservation the Wainwright buffalo park has been a marked success. In sixteen years the herd has increased tenfold and the point has been reached, indeed, where an occasional killing off of the old and surplus male animals is necessary to keep the herd in good condition within its allotted space. Eighteen hundred head were slaughtered in the winter of 1924, under direction of the Dominion Parks Branch, but by way of offset there were fifteen hundred new calves in the following spring.

Buffalo meat has thus found its way to the dinner table again. It has been served during the past two years in hotels and railway dining cars in western Canada and as far east as Montreal, and has also been sold in shops. The hides, too, give the Parks Branch a profit from the surplus killings. A good buffalo hide is worth about one hundred dollars and for a long time there were very few on the market.

To save the buffalo from extinction is not, however, the Wainwright park

keepers' full program. They are experimenting now in the production of a new type. By crossing buffalo with domestic cattle they have already secured a hybrid that promises to be of practical value. The "cattalo," as this hybrid is called, represents an effort to develop a utility animal that will better withstand severe north-



THE BUFFALO—LORD OF THE NORTH

ern climatic conditions, and putting buffalo blood into the common cow is believed to be the most likely way of doing it. The beef-producing qualities of domestic cattle are retained, but from the buffalo strain comes a lengthening of hair, so that the animal does not chill under exposure, and there is also coming a shaggy mane, which permits it to turn head to the wind instead of tail, as the cow habit is. Cattaloes seem to have combined the desirable features of both forbears and, while the experiments at Wainwright have not yet been carried to a conclusion, it is thought that success is within sight.

There are also some wild buffalo in the vast expanse of wilderness called the Northwest Territory, which adjoins the Yukon and extends to Hudson Bay. There, in a wooded country, immediately north of Alberta, are two distinct herds of about one thousand and five hundred head respectively. It is almost a primeval region and a very suitable habitat for the last large body of wild bison in existence. The one-time monarchs of the plains are still lords of the North.

An area of ten thousand square miles of this woodland buffalo country has been established by the Dominion Government as a national animal park, the newest of the bison sanctuaries. During the next four years, two thousand of the surplus animals in the Wainwright park are to be moved to the Northwest Territory and turned loose with their wilderness brothers. That will be literally a reversal to nature and, if the plan works out satisfactorily, a better way than killing off.



Photo by Wm. Caspell

PART OF THE GREAT HERD IN THE CANADIAN NATIONAL BUFFALO PARK,
WAINWRIGHT, ALBERTA, CANADA

OLD SPANISH MISSIONS

NEW MEXICO, TEXAS, ARIZONA, CALIFORNIA

WITH DESCRIPTIVE TEXT BY CLEVE HALLENBECK



SAN JUAN BAUTISTA (ST. JOHN THE BAPTIST), CALIFORNIA

This Mission was founded in 1787. A later church—the present structure—was begun in 1803. Its interior decorations were executed by a citizen of the young United States whom the padres called Felipe Santiago, but whose real name was Tom Doak

OLD SPANISH MISSIONS

THE Mission churches may be placed in two groups, one group including the churches of Texas, Arizona and California, and the other those of New Mexico. The former may properly be called "Moorish-Mission" and the latter "Pueblo-Mission."

The Moors dominated Spain for several centuries, and as a consequence Spanish architecture shows Moorish influence. This was transplanted to Mexico during the centuries of Spanish rule in the New World, and from there on up to Texas, Arizona and California, where the Mission churches, notwithstanding certain features of Aztec architecture engrafted thereon, together with other innovations imposed by limitations of material, still remain essentially Moorish. No two of the churches are alike: each reveals some whim of its designer that gives it individuality, yet this Moorish influence predominates.

The churches in New Mexico are based upon the ancient pueblo structure, with some slight modifications.

They represent the only style of architecture native to this country. In the true pueblo dwelling all lines are horizontal or vertical (a statement with which some writers may disagree), but the weathering of centuries has given these habitations rounded angles and curves, which are copied in the modern pueblo-style buildings.

The Moorish-Mission style has reached its highest development in southern California. The Pueblo-Mission style, which is peculiarly in tone with the aspect of nature in the Southwest, is found in its best form

in various parts of northern New Mexico.

Popularly, at the present day, the Mission church is spoken of as "The Mission." But the old-time Mission also included a convento, or monastery (the residence of the priests), schoolrooms and shops in which the Indian youths and maidens were taught the handicrafts of the white man, storerooms,

granaries and mills, the cabins or other living quarters of the neophytes and colonists, vineyards, orchards and cultivated fields, and often great herds of cattle, sheep and goats. Most of the Missions were great industrial establishments, and it may be remarked here that, as late as the year 1825, the California Missions produced all the manufactured goods and seven eighths of the agricultural products of that state.

The church, being the largest and most substantial of the various buildings, has endured where all the rest of the Mission buildings have fallen to ruin and practically disappeared. It was intended that the church should be the only permanent building, for as soon

as the Indians were advanced to where they were competent to earn their own living and manage their own affairs they were to be freed from the authority of the padres and allowed to take their place as self-supporting subjects of the Spanish Crown, and the Mission was to cease to exist as such. The church, however, was to remain, ministering to the spiritual needs of the Indians.

The Mission church itself was a composite building, having one or more service chapels, a baptistry, a sacristy, a mortuary chapel and one or more cloister wings. In many



Photo by Harvey Pattenon

A WINDOW OF THE SAN JOSÉ

This exquisite work, much the worse for two centuries' exposure to the elements, was executed by the Spanish sculptor Huias

cases the Mission buildings formed part or all of a hollow enclosing a patio which, where water was available, was converted into a beautiful garden. Only one of these gardens—that of the Santa Barbara in California—has been preserved in practically its original form down to the present day.

Most of the Mission churches served other outlying chapels having no resident priests. These were known as *visitas*, or *asistencias*, and to them the padres made regular visits on foot, although some of the *visitas* were ten and twenty miles from the parent Mission. If the reader ever attempts a pedestrian tour over the burning desert trails of the Southwest, as the writer has done, he will come to have a great respect for the endurance of the old missionary padres.

When a Mission was to be established a likely location was selected and there a cross was planted, a dedicatory mass said and a temporary shelter erected. Often this shelter served for a time both as a church and as the padre's residence. The congregation that heard the dedicatory mass usually was composed of two or three soldiers or laborers, with sometimes a few

curious natives in addition. Often a native interpreter was employed.

Except in the Texas field, the Indians always were friendly at the start and were glad to share such food as they had with the Spaniards. Subsequent difficulties with the natives were in nearly every case brought about through the brutality and licentiousness of the Spanish soldiers and colonists.

The erection of a permanent church necessarily was delayed until enough Indians could be collected to do the work. Other Mission buildings were constructed as needed. It is difficult to understand how the padres ever induced the Indians to engage in arduous manual labor, for in every uncivilized race the adult males are marvelously lazy. Captured "gentile" Indians, and such of the Mission Indians as had been guilty of wrongdoing, were subjected to involuntary service as punishment, but as a general rule the labor performed by the neophytes was voluntary. Spanish artisans of course executed such work as required specialized training, and many of the padres were themselves architects and artists of no mean ability; but practically all of the hard labor was done by the natives.



MISSION CHURCH AT LAGUNA, NEW MEXICO

The church in the Laguna pueblo was built after the reconquest—in 1699—and experienced a peaceful career. It contains some interesting paintings done upon elk and buffalo skins instead of canvas



REMAINS OF CALIFORNIA'S OLDEST MISSION

San Diego de Alcalá (St. James of Alcalá), founded in 1769. The church pictured above was the third, finished in 1813, forty-four years after the Mission was first established

Indian women worked right along with the men. The boulders used for the seven-foot foundation of the San Xavier were brought by Indian women from the mountains *twenty miles away*, and it is said that if they dropped one they refused to pick it up, but went back for another.

Benavides, in 1630, stated that the work of Mission building in New Mexico was done by Indian women, girls and boys, the men refusing to engage in such toil on the grounds that this would make them ridiculous in the eyes of the women. That, however, was not true in the other Mission fields, nor was it true at a later date in New Mexico.

Artisans were sent over from Spain to teach the natives the handicrafts of the white man, and each Mission became a beehive of industry. Practically every productive trade for which the materials and natural resources were available was taught to the Indians. They grew their own cotton and wool and manufactured their own clothing and leather goods, constructed their own homes and made their own furniture and household utensils, grew their own wheat and corn and ground their own flour, and

produced everything they ate, from fruit to beefsteak. Naturally, of course, the activities of different Missions varied considerably, due to differences in climate, soil and natural resources. Rainfall was deficient in all the Mission fields, and crops were grown only through the aid of irrigation.

The Indians have been credited with the development of many practical arts that really were taught them by the Spaniards. For example, it is generally believed that the Pueblo Indians of New Mexico practiced irrigation long before the coming of the Spaniards, but it now appears that this art was taught them by Oñate's followers three centuries ago.

Nearly all the Missions possessed excellent paintings sent over from Spain, together with other pictures that were the rather crude work of loving but untrained hands. Both Murillo and Cimabue are represented, although a large number of "Murillos" which that artist never saw have been discovered in the old Mission churches. Most of these paintings have been removed, but many are still to be seen in the churches of New Mexico. A few are said to be three to five hundred years old.

Many of the Mission churches possess interesting relics, such as altar services, candlesticks, vestments, reliquary cases and quaint images. Most of those that remain standing still possess one or more of their original bells, which range in age from one hundred to four hundred years. In the San Miguel chapel in Santa Fé is a rare old bell cast in 1356. It has a tone of surpassing purity and is the subject of a very interesting legend. Another New Mexico Mission has copper bells, while one in California has a set of dummy bells carved from wood.

The old California Missions were indeed most important industrial establishments, and the least one of them, in their days of prosperity, numbered its cattle and sheep by the thousands. Their shops and mills produced all the manufactured goods used in the state, with usually a surplus for export, and the most discriminating agriculturists of California to-day do not disdain to cultivate the fruits introduced into that region by the

old Franciscan padres one and a half centuries ago.

The Concepcion, Santa Cruz, Soledad, San José and San Rafael have entirely disappeared or have been reduced to shapeless masses of ruin; the San Diego, San Antonio, Capistrano, San Fernando and San Francisco Solano are in various stages of ruin, and the San Luis Obispo, San Francisco de Asis, Santa Clara and Buenaventura have been "restored" out of all semblance to the original structures. Only the San Gabriel, San Carlos, Santa Barbara, San Juan Bautista, San Miguel, San Luis Rey and Santa Ines remain practically intact and unmodernized.

All the Missions have suffered more or less from the hand of the despoiler. Several of the finest, however, are being restored and preserved for future generations as examples of what the old Spanish padres accomplished under handicaps that would have been considered insurmountable by the Anglo-Saxon.



Photo by Harvey Patteson

THE ALAMO—CHAPEL OF THE MISSION OF SAN ANTONIO DE VALERO, TEXAS

This chapel is the historic Alamo, over which have flown the flags of six nations—France, Spain, Mexico, Texas, the Confederate States of America and the United States. The final fight in the massacre of the Alamo took place in the baptistry, which is the right-hand front room



MISSION CHURCH OF SAN MIGUEL ARCANGEL, CALIFORNIA

The church, erected in 1797, was greatly damaged by fire in 1806 and the present structure was begun shortly after and completed in 1818. It is still almost intact and is in service to this day



PALA CHAPEL, CALIFORNIA—A "VISITA" OF THE SAN LUIS REY

The campanile of Pala is unique among the Mission churches of the Southwest. While nearly all the visita churches have entirely disappeared, the Pala is still in regular use



MISSION OF SAN GABRIEL ARCANGEL, CALIFORNIA

A new and unusual photograph of San Gabriel, showing a side view of the Mission. The first church, built in 1771, was destroyed by the earthquake of 1812 and the present structure was erected shortly after. It was extensively repaired in 1886 and continues in service



Photo by Petram Studios

MISSION OF SANTA BARBARA, CALIFORNIA—Seriously damaged by the earthquake of June, 1925

This structure was built in 1820, replacing the church erected in 1793. The Santa Barbara has been kept in fair repair and is still in use. It is the most widely known of the California Missions, but architecturally is inferior to the San Luis Rey



MISSION OF SAN LUIS REY DE FRANCIA, CALIFORNIA

This Mission, while considerably the worse for wear, is the architectural gem of the California Missions. While the Mission itself is one of the youngest, this church is one of the oldest in the state, having been completed in 1802



PATIO OF THE MISSION OF SAN JUAN CAPISTRANO, CALIFORNIA

Shows a corner of the cloister-enclosed patio. The Capistrano was founded in 1776, but the church was not completed until 1806. It originally had seven domes. The earthquake of 1812, which damaged all the California Missions, sent the tower of the Capistrano crashing down through one of the domes, killing forty-three Indians who were attending Sunday-morning mass. Four more of the domes were deliberately destroyed some sixty years ago



MISSION OF SAN FERNANDO REY DE ESPAGNA, CALIFORNIA, LOOKING EAST

This church, erected in 1818 to replace the original one finished in 1806, which was destroyed by the earthquake of 1812, is now itself in ruins



MISSION OF SAN CARLOS BORROMEO, CALIFORNIA

Now popularly known as "Carmel." The San Carlos was first established in 1770 where Monterey now stands. In 1772 it was moved to a site on the Carmelo Creek and the present church built. It was repaired and rededicated in 1884. Fr. Serra and his successor as padre presidente, Fr. Lasuen, are buried in this church



Photo by Harvey Pattenon

FACADE OF THE SAN JOSÉ, TEXAS

Shows the beautiful carving executed by the famous Spanish sculptor Huisar. Huisar spent twenty years on the San José, and his work has been studied by artists from all parts of the civilized world



Photo by Petrus Studios

MISSION OF SAN XAVIER DEL BAC, ARIZONA

Bac is an Indian word meaning water or marshy ground. The San Xavier Mission was founded in 1700, but the present buildings were not begun until 1785. The dome was intentionally left off the right-hand tower. The San Xavier is the finest example of Mission architecture in America



CHURCH OF THE MISSION CONCEPCION PURISIMA DE ACUNA, TEXAS

The Church of the Very Pure Conception is situated near San Antonio. It was begun in 1716 and is now largely in ruins. It is one of the three Moorish-style Mission churches in the United States having twin towers. The chapel of the Mission is still in use as a Catholic church



Photo by Harvey Patterson

SAN JOSÉ DE AGUAYO, TEXAS

This Mission, dedicated to St. Joseph, was begun in 1720, and in honor of its patron, the Marquis de Aguayo, his name was added thereto. The San José when intact was one of the most beautiful Mission churches on the continent, and its sculptured façade and windows are especially admired. At the height of its career the San José was the most important Mission in the New World and was the official residence of the padre presidente of the Mission field



MISSION OF SAN JUAN CAPISTRANO, TEXAS

The facade of this church, which was dedicated to the militant German Franciscan, John Capistran, is about all that remains of the original structure, while the numerous other buildings have disappeared or are entirely in ruins. Near the San Juan is to be seen one of the stone aqueducts used to convey water from the San Antonio River to the gardens, vineyards and orchards of the Mission

THE HOME OF RAMONA

SCENES ON THE CAMULOS RANCH, CALIFORNIA



ENTRANCE TO THE CHAPEL

Camulos Ranch has been an object of literary pilgrimage ever since Helen Hunt Jackson went to southern California in 1882 and built up her immortal story of "Ramona" upon experiences and impressions gathered during a visit to this old Spanish California plantation. "Ramona" is the most widely read book in California to-day despite its age. An authority who is foremost in knowledge and experience in the matter deems it a conservative estimate that the novel has been worth \$50,000,000 to southern California in the tourist interest that it has aroused



CAMULOS RANCH—THE FOUNTAIN

In this lovely spot Helen Hunt Jackson set the scene for the story of her romantic hero and heroine, Alessandro and Ramona. This exquisite setting so thoroughly imbued her with the spirit of old Spanish California that she breathed into her work the very breath of life.



CAMULOS RANCH—THE COURT

Many travelers who pay a visit to the ranch believe that Ramona, Alessandro and Señora Moreno really lived. Home scenes like this are pointed out as actual historical background



From a photograph by A. C. Vroman. Courtesy Los Angeles County Bureau of Visual Education

CAMULOS RANCH—SOUTH VERANDA

Readers of "Ramona" will recognize this picture, which shows the front of the old Camulos house. According to the story, on that upper porch Señor Felipe, ill of the fever, lay on the pallet of hide that Alessandro made for him. In that room at the right, behind the barred window, Ramona had her little sanctuary. There, when imprisoned and separated from Alessandro, she gave her soul to prayer



CAMULOS RANCH—THE BELLS

California is a land of bells. In Mission and ranch may be found many bells of historic and romantic interest. In the Mission Inn at Riverside, Cal., there is the greatest collection of old bells in the world, gathered by Mr. Frank A. Miller. Here are three of the old bells of Camulos Ranch, set up in a picturesque part of the grounds



Photo by Roy V. Davis

LONG BIG ROOM, CARLSBAD CAVERN

This cavern, believed to contain the most stupendous underground chambers in the world, lies in the foothills of the Guadalupe Mountains, New Mexico. Long Big Room, a portion of which is pictured above, is a half mile in length

CARLSBAD CAVERN

A WONDERLAND IN THE UNDER-LAND OF NEW MEXICO

BY GUY E. MITCHELL

OUT in southeastern New Mexico, and crossing over the Texas line, the rugged Guadalupe Mountains rise to heights of from 8,000 to 10,000 feet, cut by impressive and often magnificent canyons. This remote mountain range has had little more than local fame and not much of that, except as a rather inaccessible place of retreat during early Indian and border warfare. But the mountains have suddenly become nationally famous and bid fair soon to be world-renowned. A great cavern, the like of which has never yet been found, has been discovered in the foothills of the Guadalupe, while explorations during the coming season may, it is thought, even double the spectacular importance of the new wonder spot.

Most subterranean caverns have been discovered by accident, stumbled across through someone seeking shelter or safety

from enemies, or through boys and dogs chasing a rabbit into a hole, or some such commonplace happening. The new Carlsbad Cavern of New Mexico, as now known to the public, is the result of a scientific, geologic study and tracing of rock strata—a systematic investigation of the structure of the bed of a near-by river; but the magnitude of the incidental cavern discovery has wholly swallowed up any importance that attached to the original investigation.

The Carlsbad Cavern is not only believed to contain the most stupendous underground chambers in the world, and the greatest number of them, but the natural decoration and ornamentation of the great rooms and towering corridors are superb. Millions and billions of stalactites and stalagmites in every variation of form and design, created out of the purest glistening onyx, may be seen in endless array. From the tiniest stone icicles



Kadel & Herbert

TEMPLE OF SOR

This chamber and the one shown in the opposite picture display the gorgeously rich and varied effects of a vast spectacular scenic drama. Mother Nature has here fairly outdone herself in fantastic decoration

as delicate as a jeweled pendant to huge monuments and fluted pillars weighing thousands of tons, and from draperies appearing as flimsy as a bride's veil to others as rich as heaviest Oriental tapestry, Nature, through the long ages, has cut and carved and woven in everlasting stone a scheme of decoration beyond compare and indeed quite beyond description.

Although a hole in the side of the mountain has been known for years as the Bats' Cave, on account of the large colony of bats which roost near its mouth, it remained for Willis T. Lee, a geologist of the United States Geological Survey, who was investigating the near-by Pecos River with reference to sites for irrigation dams, to trace the peculiar rock structure back to the Guadalupe Mountains and rediscover for the world the great cavern. Dr. Lee characterized it as huge, entrancing, wonderful. He explored some seven or eight miles of its interior, descending nearly a thousand feet in that distance, and found among other great rooms a single chamber over half a mile in length and so high that the bright 300-foot beams of his electric torch were lost in the gloom overhead. To

this vast amphitheater he gave the simple name of The Big Room; it was too huge, too majestic, to be accorded any fanciful title, although in the systematic exploration and survey of the cavern next year it is purposed to draw freely upon the rich Indian mythology of the Southwest in the naming of the many features of the new cavern. The Big Room is not a bare amphitheater. It is filled with ancient statuary and carvings, beautifully designed and ornate but of truly heroic mold. It might well have been the lounging-room of the giant warrior gods of the Navahos, mythical beings so huge that they used the largest tree trunks for arrows. To the Indians the hundred-foot logs of the Petrified Forest of Arizona are the broken arrows of Shinav, the Navaho god of battle.

This great cavern may be of somewhat mysterious origin to the usual visitor, but to the geologist it is an open book of nature. The immense rooms and the miles of lofty galleries are cut out of solid limestone, and water, charged with carbon dioxide, is the simple chemical agent which Nature has employed during countless centuries in her unhastening but unrelenting work. The cavern



Kadel & Herbert

LIGHT AND SHADOW IN CARLSBAD CAVERN

From the mysterious recesses of the great chamber we might expect to see the sturdy figure of Siegfried emerge, sword in hand, or the Nibelung dwarfs of the underworld toiling beneath their burdens. The weird and picturesque formations in the cavern are full of dramatic suggestions

has been cut in and out irregularly through a stratum, or bed, of solid limestone 1,300 feet thick, and while billions of tons of the hard rock have been dissolved and carried away by the waters, vast deposits of pure carbonate of lime have, as a part of the process, been left suspended from the roof or built up from the floor.

Dr. Lee's present exploration is simply a beginning. The coming season he will attempt a complete investigation and accurate survey of the vast honeycomb through this 1,300 feet of limestone; but he has something yet more ambitious in view, which discloses the fact that the scientific imagination may outclass even the vivid mental processes of disciples of pure fiction. Lying immediately beneath the 1,300 feet of solid limestone out of which the Carlsbad Cavern has been carved, the rock outcrops at the surface disclose to the geologist a 1,000-foot stratum of soft shale and limestone, lying at an angle to the surrounding plain and interspersed with thick beds of gypsum and salt. Since these gypsum and salt deposits constitute at least one half of the shale and sandstone stratum, or about 500 feet, and

because both are easily soluble in water, it is evident that this 1,000-foot stratum also may contain the most spectacular caverns. And there is a scientific basis for this supposition, for Dr. Lee speaks of a huge spring of lime water emerging from the mountain slopes, evidently draining through the cavern. But he also found another mineral spring gushing forth at a lower level, which contained half lime and half gypsum.

But a yet greater possibility lies in a cavernous condition which the geologist asserts is to be found in a vast bed of limestone some 5,000 feet thick, underlying the 1,000-foot stratum of shale, sandstone, salt and gypsum. A number of caverns in this thick bed of limestone have already been discovered though not explored, yet one is described as even larger than the now famous "Big Room" in the Carlsbad Cavern. The Carlsbad Cavern is probably only one of many great or greater caverns in the Guadalupe Mountains. The world contains many examples of immense isolated limestone caverns, but clusters of gigantic caverns are rare.

The Carlsbad Cavern was formally proclaimed a National Monument last October.



© E. V. Davis

SHINAV'S WIGWAM

The cavern is estimated, from the stalagmites and stalactites, to be between 500,000 and 600,000 years old. This photograph, taken by the aid of magnesium flares, shows a number of tourists resting after exploring the chambers of this awe-inspiring underground fairyland



Photo by R. V. Davis

EASTERN END OF LONG BIG ROOM

A close-up view of some of the amazing formations and picturesque monuments of the cavern



Kadel & Herbert

REAR VIEW OF TWIN DOMES

Great columns, like giant fingers, rising from the foundations of flowstone



THE DEVIL'S POSTPILE †

BY HERBERT W. GLEASON

In the first place, it doesn't belong to the Devil—and he never had anything to do with it. It belongs to the entire people of the United States. On July 6, 1911, it was set apart, together with the immediately adjacent region, as a national monument.

The Devil's Postpile National Monument is a small rectangular area, only half a mile wide from east to west and two and a half miles long from north to south, lying on the western flank of the main crest of the Sierra Nevada Mountains in California.

The entire upper basin of the Middle Fork of the San Joaquin River, in which the monument lies, abounds in evidences of volcanic activity of very recent date, geologically speaking. This is manifest especially in the presence everywhere of pumice and volcanic ash and the outcropping in many places of volcanic rock.

The climax of the exhibition is found in the national monument, where at various points are seen huge masses of crystalline basaltic rock, having the marked columnar structure characteristic of that type of rock, the different elements of which are packed closely together, like bundles of gigantic fibers. Sometimes these columns are perpendicular, sometimes horizontal, and sometimes they are twisted and contorted into strange shapes. In size they are usually from one to two feet in diameter and in many cases they reach forty feet in length. They are chiefly five-sided in cross-section, though many are six-sided and occasionally some are four-sided. Where the columns are perpendicular and the upper surface has been ground down by glacial action the appearance is precisely that of an enormous honeycomb.

The most notable of these basaltic exposures is the Devil's Postpile itself. This is a steep cliff fifty feet high and one hundred and forty feet long, the western face of which presents a stupendous aggregation of these many-sided columns, most of which are in a nearly vertical position. At the base of the cliff there is heaped up an immense mass of fragments of broken columns, evidently the remains of former members of the vertical

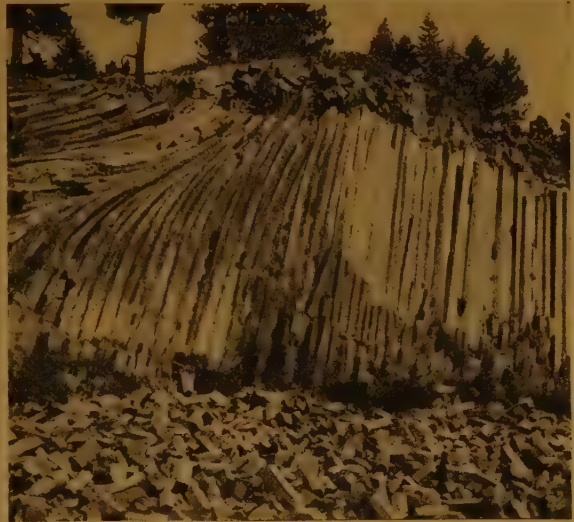


Photo by Herbert W. Gleason

THE DEVIL'S POSTPILE, SHOWING CONTORTED COLUMNS OF LAVA

company, which, having been loosed from their erect position by the action of frost, have toppled over and been broken into many pieces. The appearance is just as if some prehistoric giant had set up here a pile of stone posts and then had spent some time sawing up a lot of them into small blocks.

Geologists are not quite clear as to what causes this peculiar columnar structure in basaltic rock. It is a form of jointing, but why the divisions in the rock mass should be so uniform and with such a marked honeycomb-like effect in cross-section is something of a conundrum. Basalt is only one of many forms of lava, belonging to the acidic group, i. e., possessing a considerable degree of iron or other minerals in its composition. The molten rock, after being ejected from the volcano or issuing from a volcanic fissure, as the case may be, cools slowly and gradually assumes this vertical prismatic structure. If the mass is not disturbed by outside pressure before the rock is thoroughly hardened, the columns remain vertical; but if such pressure occurs during the process of cooling, the columns will be bent out of their erect position.

The Devil's Postpile is one of the most notable examples of columnar basalt in this country, and belongs in the same class with the more famous Giant's Causeway on the north coast of Ireland and Fingal's Cave on the Island of Staffa off the west coast of Scotland.

AIL, AND THE DAMAGE IT DOES!

Often the Size of Marbles and Sometimes as Large as Golf Balls, Hailstones are Direful Missiles of Destruction

BY C. F. TALMAN

In the year 1757 there was much excitement in Berlin over rumors of an impending war. In order to give the people something else to think about, King Frederick the Great caused a fanciful story to be published in the newspapers about a hailstorm at Potsdam, in which hailstones as big as pumpkins were said to have killed cattle. The story had the desired effect. The public was all agog about the new wonder; meteorology crowded belligerency out of the limelight; and a political crisis was successfully *weathered* by a bogus storm.

Just how far from possible was this tale of the Prussian king? A cattle-killing hailstorm would certainly be an extraordinary event in Prussia, but there are other parts of the world in which it would hardly be a novelty. In the state of Bhor, India, more than 800 head of cattle were killed on October 5, 1893, by hail which covered the ground to a depth of from four to six feet. Several human beings perished in this storm. In the Moradabad district of India on May 1, 1888, about 250 people were killed by hail. Some were slain directly by the hailstones, while others perished from exposure in consequence of the intense cold accompanying the storm. India has experienced many other hailstorms in which men and domestic animals have been killed by icy missiles from the sky. Both in that country and elsewhere hailstones have accomplished surprising feats of destruction. There is no authentic record of hailstones as big as pumpkins, but they are sometimes bigger than oranges. As to the force with which they strike the earth, they have been known to go through tiled roofs and to bore clean round holes through panes of glass without cracking them. A case has been described in which hailstones buried themselves to a depth of more than half a yard in the soil of a meadow.

Throughout the world it is estimated that



P. S. A.

A BASKET FULL OF HAIL

Hailstones larger than eggs and falling with tremendous speed created havoc in Nyack, N. Y., during a storm on May 25th last. The size of these hailstones may be judged by comparing with hands that hold basket

hail exacts from the human race an annual toll of something like two hundred million dollars. Most of the damage is not done by hailstones of very large size but by ordinary hail falling on tender vegetation. Certain crops are notoriously subject to injury from this cause. In the United States probably the heaviest losses, in proportion to acreage, are borne by tobacco, while in the Old World the vineyards are the greatest sufferers. A single hailstorm in the tobacco-growing districts of Connecticut last year caused losses amounting to a million dollars.

Hail is an episode of the thunderstorm, and, like the latter, is of world-wide occurrence. It falls in the equatorial and polar regions, though it is more common in middle latitudes. When a summer thunderstorm approaches, hail is most likely to fall at the beginning of the storm, and it seldom lasts more than a few minutes. As a rule, it falls over only a small area compared with the storm as a whole, and this area frequently takes the form of one or more narrow "hail bands" extending along the general path of the thunderstorm. Such was the case in the historic storm of July 13, 1788, which caused immense losses in France and traveled northward as far as Holland. A contemporary map of the storm, which has come down to us, shows that hail fell in two parallel bands

about 12 miles apart. The western band was about 10 miles wide and 420 miles long, the eastern, 5 miles wide and nearly 500 miles long.

True hail is often confounded with two other kinds of icy particles which, because of their small size and because they do not usually fall during the agricultural season, rarely do any damage. One of these takes the form of miniature snowballs, which, unlike hail, crumble easily and have therefore sometimes been called "soft hail." The German name for this kind of precipitation is "graupel," and this name is now in general scientific use in English. The other form of icy particles consists of little pellets or angular fragments of clear ice—frozen rain-drops. This is now officially called "sleet" in the United States. Unfortunately other things are widely given the same name, both in this country and abroad, and the term "sleet" has given rise to a vast amount of confusion and discussion. A distinguishing feature of a true hailstone is that it is composed partly of ice and partly of snow. Large stones frequently show several alternate layers of these substances. This peculiar structure is explained by the fact that hail is formed in a turbulent region at the front of a thundercloud, where it makes several journeys up and down between relatively cold and relatively warm levels of the atmosphere before finally falling to the ground. At high

levels the incipient hailstone is coated with snow, and at lower levels with rain, which changes to ice as the stone is again carried aloft. The center of the hailstone is snowy, probably consisting of a grain of graupel. Most hailstones are approximately spherical or somewhat conical, but other and very striking shapes are sometimes found. Occasionally the surface is encrusted with curious crystalline growths.

One of the oddest hailstorms on record was observed some years ago by Prof. W. G. Brown of the University of Missouri. He tells us that the hailstones "on coming in contact with the windows or walls or pavement exploded with a sharp report, so loud as to be mistaken for breaking window panes or a pistol shot. As the hail fell the fragments sprang up from the ground and flew in all directions, looking like a mass of 'popping' corn on a large scale."

In Europe a shocking amount of money has been wasted in efforts to avert hailstorms by firing off cannon and by the erection of "hail-rods," modeled after lightning-rods. These expedients are as futile as the rain-making schemes by which American farmers are so often deluded. The practice of insuring crops against hail has prevailed for generations in the Old World and has recently become very common in the United States, where about \$40,000,000 in premiums were paid last year for this kind of insurance.



DAMAGE WROUGHT BY HAIL TO ALLEGHENY CONSERVATORY, PENNSYLVANIA, ON MAY 20, 1893



PROTECTION AGAINST LIGHTNING

The Safest Place When Lightning Flashes,
Determined by a Series of Electrical Experiments

BY DONALD MACGREGOR

"Unless a lightning rod or other object extends to more than two and a half per cent of the height of a thundercloud above the ground, it will not always be hit by a lightning flash. If the rod is only one and a tenth per cent of the height of the thundercloud the hits are about equally divided between the rod and the ground.

"Lightning either strikes the rod or some distance away. There is a protected area around the rod with a radius equal to four times the height of the rod.

"A person directly under a thundercloud during an electrical storm is in fifteen times as much danger of being struck if he is standing as he is if he is lying flat on the ground. However, the chance that a thundercloud of sufficient voltage to cause a discharge will be directly over any particular object is extremely small.

"Lightning rods seem to be of real value for the protection of buildings, but, except for buildings in exposed positions or in special cases, such as powder magazines, the cost of a rod is not warranted unless it is quite low."

These are the observations of F. W. Peek, Jr., consulting engineer of the General Electric Company, after a series of experi-

ments with real and artificial lightning, contributed as an added chapter to the findings of the scientific research that has continued ever since that stormy day in June, 1752, when Benjamin Franklin, with his famous kite, proved the suspected fact that flashes from the sky are an electrical phenomenon.

They are based on extensive tests with real lightning in the mountains of Colorado and elsewhere and artificial lightning flashed upon a miniature village in the General Electric Company's high-voltage laboratory in Pittsfield, Mass. The purpose has been the protection of life and property from destruction by this great natural force.

For many years the study of lightning has been conducted in Europe and America. Scores of talented scientists have risked and sacrificed their lives in the work. Franklin's key at the end of the string gave way long ago to constantly improved and costly apparatus essential in the quest of knowledge. Statistics showing the havoc of lightning have been gathered in all the civilized countries for long periods for expert analysis.

Within the time scores of superstitions attempting safeguards against lightning have been built up and exploded. The famous lightning-rod agents have prospered and died. But some important truths have been recorded.

Among other facts, scientists have learned that, as a yearly average, lightning kills five persons out of every million of population; that lightning is fatal to only one of every four persons struck, and that the extent of death and injury varies with different nations and even with local conditions. They have discovered, also, that a building in the open country is five times more likely to be hit than a building in the city, where its neighbors may absorb the bolt; that the reason so many cattle are killed by lightning, particularly in the West, is the custom of building



Photo by C. E. Waters

A TYPICAL SUMMER THUNDERSTORM WITH
FLASHES OF "STREAK" LIGHTNING

wire fences, which conduct the discharge for comparatively long distances to corners where the cattle have taken refuge from a storm.

The occasional odd pranks of lightning are commonly known—and credited in science. The fortunate three out of four whom lightning fails to kill may suffer nothing more serious than a complete loss of clothing or a condition in which the hair refuses to grow or imprint strange markings on the body.

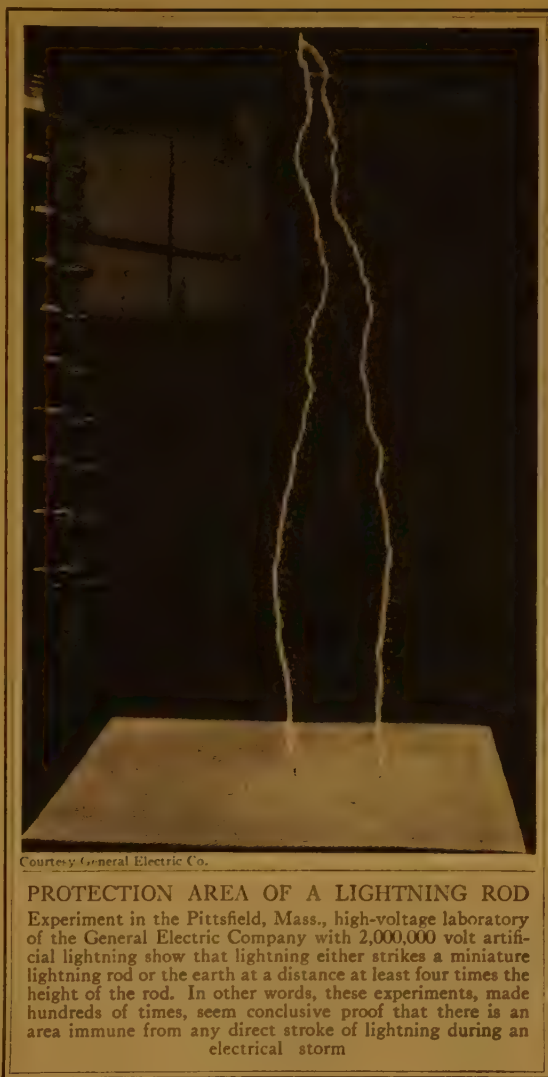
It is the peril of lightning in relation to applied electricity that prompted Mr. Peek to build in the Pittsfield laboratory the miniature village, with its houses, proportionately larger buildings, streets, trees and even a miniature transmission line, through which an electrical current flows, so that the information might be as accurate as possible. His equipment permitted him to produce rain and to create artificial lightning of more than 2,000,000 volts.

"The voltage of lightning is of the order of 100,000,000, or about a million times the voltage of the ordinary lighting circuit, or a thousand times the voltage of a very high voltage transmission line," Mr. Peek explained in his laboratory at Pittsfield. "The energy is sufficient to operate an electric automobile for about five miles or an electric toaster for a day. Since this energy is dissipated in a very short time the power may be several thousand million kilowatts or horse power. The effect is thus explosive and destructive.

"A lightning flash near a transmission line may cause dangerous voltage. The line is very seldom directly struck, but the effect is generally by induction.

"A study of lightning is of scientific importance because there is manifest in the flash the dynamic effect of the electrons and ions, the elemental bricks of which it is believed that all matter is made; it is of engineering importance because an exact knowledge of the characteristics of lightning will make it possible to protect life, buildings and transmission lines. The ideal method of making such a study is by observations of natural lightning in the field and researches with artificial lightning in the laboratory.

"The artificial lightning was obtained by means of a lightning generator which supplies 2,000,000 volts at an energy of 2,000 watt seconds, and the character of the discharge is similar to that of natural lightning. The destructive effects also are similar.



Courtesy General Electric Co.

PROTECTION AREA OF A LIGHTNING ROD

Experiment in the Pittsfield, Mass., high-voltage laboratory of the General Electric Company with 2,000,000 volt artificial lightning show that lightning either strikes a miniature lightning rod or the earth at a distance at least four times the height of the rod. In other words, these experiments, made hundreds of times, seem conclusive proof that there is an area immune from any direct stroke of lightning during an electrical storm

"A good many of the old superstitions about lightning are without foundation. There is nothing to the theory that a person is safe on a feather bed. And there is nothing to the statement that a draft through a room will cause lightning to go through. Lightning travels so fast and with such force that a gale would have no influence upon it whatever.

"A person in the open would minimize his chance of being struck by lying flat on the ground. It is not safe to stand under a tree. A tree may be conductive enough to direct the stroke to itself but is not conductive enough to direct the lightning current to the ground. The result would be an explosive action on the tree and probably side flashes to the person standing under it."



© Raymond Fuller

LOOKING UP AT BORO BUDDOR

Forty years ago, before excavation, this ancient shrine looked like a hillock of earth overrun with plants and bushes



BORO BUDDOR— JAVA'S WONDER MONUMENT ❖

About two thousand years ago, when there was in Italy a most flourishing citylet called Rome, Java suddenly turned to Hinduism. At least, her ruling families did. India sent her religious ambassadors and teachers, and the whole island became in a surprisingly short time officially converted to Buddhism. During the Buddhistic period Boro Buddor was created.

Born of stone and labor, under the god-fathership of art, Java's great architectural monument came into existence. Then in the fourteenth century the irresistible pulse beat that came from the heart at Medina infused into the languid veins of Java a new impulse, and Mohammed has been their accepted prophet ever since.

Boro Buddor, buried for centuries, was dug out of the ground by Europeans.

It is an astonishing find. What a digging was here! What an unlooked-for splendor came out of the earth!

The ruins of Boro Buddor are an hour by motor from Djokjakarta in middle Java. The general form of the mound-enclosed "temple" is that of a broad-based pyramid of relatively low elevation, but the sides of the base are not straight lines but polygons. Its interior core has little masonry in it. Successive terraces feature its sloping sides, and upward on each slope runs a stairway elab-

orately arched and balustraded from base to summit. The eye is deceived as to the truly great dimensions of the pile. This terracing has upon two levels continuous series of remarkably good bas-reliefs that would measure, if put end to end, *over three miles*. Still another level, the lowest one, which has not been at all excavated, carries, it is said, still a third stretch of these elaborate bas-reliefs well-nigh equal to the lengths of the other two combined. The life and myths of Buddha form the legendry of practically every yard of these vertical-wall picture books. These levels, as well as all the upper ones, also carry a fabulous array of stone statues of Buddha, each either set in a shrined niche or curiously encaged in stone-grilled, bell-shaped dagobas, beyond reach of supplicant or desecrant. Surmounting the whole, acting as a kind of glorified capsheaf, stands a pleasingly proportioned giant dagoba, also bell-shaped and with a spire whose tip reaches yet a height of 105 feet above the ground. It is only by mounting the successive flights of arched stairways to the summit and by exploring up and up on the massive terraces that one gets a grasp of what years it consumed in the fashioning and what laborious days and man-muscle marked its rising.

Scholars have concluded that it was designed and overseen by zealots from India, and indeed the faces and figures in the reliefs too strongly suggest Hindus and Greeks to allow us to doubt it. So here again that highly mysterious strain of Greek culture crops up in things Javanese.

Raymond Fuller.



THE BUILDING OF THE GREAT WALL

BY GENE BERTON

The Chinese have named it "The Wall of Ten Thousand Miles." It extends in a generally east and west direction one thousand five hundred miles through the northern part of China, and its track looks much as if a black thread had casually been dropped on the map of that country. The eastern end rises out of the sea at Shanhaikuan, on the Liautung Gulf, and stretches westward until it finally ends on a precipice overlooking forbidden Tibet. It has been said that the wall "followed the line of greatest natural resistance." Whoever traced its course seems to have wanted to make its construction as difficult as possible. It creeps across sun-dried plain, spans rivers, jumps gorges, climbs steep mountain slopes till at one point it reaches an altitude of four thousand feet.

The sides of the wall, which rise to a height of thirty feet, are built of heavy masonry surmounted by a brick parapet. The space between the two outer retaining walls is filled with large rocks covered with trampled earth. Originally, only those portions of the wall that crossed the main roads and caravan routes entering China were built of brick and stone. Later the gaps between these points were built up so that, with the exception of short stretches, the

wall presented an unbroken line of masonry over twelve hundred miles long.

Construction of the Great Wall was begun in the year 214 B. C. by Shih Hwang Ti, the first emperor, who had spent the previous seven years of his reign abolishing the feudal system and destroying the Chinese classics, including the revered works of Confucius. History records that the first emperor was a superstitious individual and that he had been warned in a dream of a danger that would come from the north. Most likely he built the wall to protect his domains from invasion by the Tatar and Mongol.

Hwang Ti conscripted every third able-bodied man in his empire and put them to work on the wall which was to be "one twentieth of the circumference of the earth." Rich and poor, noble and peasant, were pressed into service; neither rank nor wealth was accepted as a reason for immunity. If a worker weakened under the arduous labor or became insubordinate, he was killed and his body thrown in with the rocks and earth that went into the wall. So many suffered this fate that the wall has been called "the longest cemetery on earth."

The first emperor did not live to see the completion of the Great Wall. Much was done by his successors. Reconstruction of the wall was carried out in the fifteenth century by the enterprising and resourceful Ming emperors. To-day it stands as a great feat of engineering and as one of the seven wonders of the medieval world, but Shih Hwang Ti, who conceived it, is not remembered by the Chinese as "the builder of the Great Wall" but as "the burner of books."



THE GREAT
WALL

The wall is in the best state of preservation at Nankow Pass, forty miles from Peking, where the modern railroad cuts through it. At this point it is twenty feet thick at the base



Photo by P. E. Budlong

CREPUSCULAR RAYS: "THE SUN DRAWING WATER"

Known in some parts of England as "Jacob's ladder," in Ceylon as "Buddha's rays," and called "the ropes of Maui" by the Polynesians



WE CALL IT "THE
SUN DRAWING
WATER" ❖ ❖ ❖

When sunbeams radiate from behind a bank of cloud we commonly say that the sun is "drawing water." This means that we believe that the beams are visible streams of moisture sucked up from the earth.

The scientific name for these beams is "crepuscular rays." They are not, as popularly supposed, streams of vapor that the sun is "drawing" to itself but merely sunbeams made visible by a haze of water droplets or dust in the air, in the same way that sunbeams are made visible by dust in the air of a room. The apparent outspread divergence of the beams is an effect of perspective, as they are really parallel.

There are other and more picturesque names for this pretty freak of sunlight. Sailors call the beams the "backstays of the sun." In parts of rural England they are known as "Jacob's ladder," and in far-away Ceylon as "Buddha's rays." The Polynesians call them "the ropes of Maui."

A South Sea legend goes with that last name. Long ago the sun god, Ra, was not so regular in his habits as he is to-day. In fact,

he rose and set whenever he pleased, without the least regard for the convenience of mankind. It was hard for mortals to adjust their occupations to the capricious behavior of a sun that would sometimes set in the middle of the day and sometimes rise at midnight. At last the great hero Maui resolved to make him mend his ways. The first step was to capture the erratic deity, and in order to do this Maui set six snares of strong coconut fiber along his daily path. When Ra next started to cross the sky the first noose encircled him but slipped down and only caught his feet. The second slipped, too, but caught the sun god's knees, while the third caught him about the hips. Still Ra pressed on. The fourth noose tightened around his waist, the fifth under his arms, and finally the sixth caught him around the neck and nearly strangled him. Only then did the sun god confess himself conquered; and he begged for his life, promising that in the future he would observe regular hours. Maui let him go, but wisely refused to remove the ropes, as he wished to keep him in fear. To this day the ropes can be seen dangling from the sun to prove the truth of the story. So these sunbeams are called "the ropes of Maui."

The word "crepuscular" means "twilight," the rays being often seen at sunrise or sunset.



THE STORY OF THE RAINBOW

BY RICHARD DEAN

The lovely offspring of showers and sunshine that we call the "rainbow" bears a multitude of other names throughout the world. The French call it the "arch in the sky;" the Italians, the "flashing arch." In various dialects of southern Europe it is known as the "arch of St. Martin," the "crown of St. Bernard," the "bridge of the Holy Spirit," the "girdle of God." In Sanskrit it is known as the "bow of Indra;" the Annamites call it the "little window in the sky," and the Kabyles of northern Africa the "bride of the rain."

According to legend, the proverbial pot of gold found at the foot of the rainbow is worth three ducats and the finder is generally a "Sunday child;" i. e., a person born on Sunday. Rainbow gold has been especially identified with certain coins of pre-Roman age, specimens of which are well known to

collectors. Probably the washing of the soil in a thunder shower has sometimes brought these old coins to light and has thus given rise to the belief in their miraculous origin.

"All the colors of the rainbow" is a common expression. How many colors has the rainbow? Perhaps you will declare, on the strength of a stereotyped statement of the schoolbooks, that there are seven of these colors. Did you ever try to count them? Theoretically, they are there. Actually, there is so much overlapping of them in the average bow that the eye cannot distinguish more than four or five. There is a good deal of variation both in the colors and in the amount of space occupied by each, depending chiefly upon the size of the raindrops in which the bow is formed. The minute droplets of a fog produce a bow that is almost white.

Two rainbows can generally be seen at a time—the inner, or *primary*, and the outer, or *secondary*. If you look closely you can usually see one or more repetitions of the prismatic colors along the inner edge of the primary bow, and sometimes also along the outer edge of the secondary. These are known as *supernumerary* bows. The colors



Courtesy U. S. Weather Bureau

AFTER THE STORM—A DOUBLE RAINBOW

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This Test Will Tell You

THOUSANDS of persons make little mistakes in their everyday English and don't know it. As a result of countless tests, Sherwin Cody found that the average person is only 61% efficient in the vital points of English. In a five-minute conversation, or in an average one-page letter, five to fifty errors will appear. Try the test shown below, now. See where you stand on these 30 simple questions.



Sherwin Cody

MAKE THIS TEST NOW

Correct answers shown in panel below

1. Would you write—?

Between you and I	or	Between you and me
I did it already	or	I have done it already
Who shall I call?	or	Whom shall I call?
It's just as I said	or	It's just like I said
The river has overflowed its banks	or	The river has overflown its banks
I would like to go	or	I should like to go
I laid down to rest	or	I lay down to rest
Divide it among the three	or	Divide it between the three
The wind blows cold	or	The wind blows coldly
You will find only one	or	You will only find one
2. How do you say—?

evening	or	eve-ning
ascertain	or	as-cer-tain
hospitable	or	hos-pit-able
abdomen	or	ab-do-men
mayorality	or	may-or-al-ty
amenable	or	a-me-na-ble
acclimate	or	ac-cli-mate
profound	or	pro-found
beneficiary	or	ben-e-fi-sh-ary
culinary	or	cu-li-na-ry
3. Do you spell it—?

supercede	or	supersede
repel	or	repetition
relieve	or	separate
donkeys	or	acomodate
factories	or	trafficking
	or	acesible
	or	accessible

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Answers

1.

Between you and me
I have done it already
Whom shall I call?
It's just as I said
The river has overflowed its banks
I should like to go
I lay down to rest
Divide it among the three
The wind blows cold
You will find only one
2.

evening
as-cer-tain
hos-pit-able
ab-do-men
may-or-al-ty
a-me-na-ble
ac-cli-mate
pro-found
ben-e-fi-sh-ary
cu-li-na-ry
3.

supersede repetition
receive separate
relieve accomodate
donkeys trafficking
factories accessible

they show most distinctly are red and green.

The rainbows we have thus far mentioned are common, but there are others that appear only under exceptional circumstances. For example, the image of the sun on the surface of a body of water sometimes produces a bow or a pair of bows, rivaling in splendor those formed by the sun directly. As the center of a rainbow is always diametrically opposite the source of light, these reflection bows are centered much higher in the sky than the ordinary rainbows formed at the same time and thus generally intersect the latter. A reflection bow may be seen as a complete circle, but it more often happens that only the lower part of the circle is visible, and thus we get a rainbow upside down. A horizontal layer of water drops may be those of a low-lying sheet of fog or of water deposited on a floating film of oil or, finally, actual raindrops, seen when the observer is on a mountain or other eminence above the level of the rainstorm. The ruddy disk of the sun near the time of its rising or setting sometimes gives us a red rainbow. The rainbows produced by the moon generally show little color, on account of the faintness of the light, but the brighter lunar rainbows are distinctly colored.

What makes the rainbow?

Here are a few of the essential facts: We see the rainbow when the sun is at our backs and rain is falling in front of us. The sunlight enters the drops and is reflected from their inside surface. In this process the light is resolved into the so-called "primary" colors arranged in this order: violet, indigo, blue, green, yellow, orange, red. (You can fix this sequence in your mind by noting that the initial letters form the word *Vibgyor*.) The different colors follow different paths inside the drops and are still further separated in emerging. Moreover, for certain geometrical reasons, there is a concentration of the light of each color in a particular direction. Thus drops in a certain direction from the observer send to his eye green light, those in another direction red light, and so on. The overlapping of the colors, which makes it practically impossible to distinguish all of them, is due to the fact that the sun is not a sharp point, but a broad disk, which casts light at various angles upon each drop.

A certain amount of light is reflected twice inside the drop before it emerges. This produces the fainter secondary bow outside the primary. The reflection reverses the order of the colors, which run from violet inside to red outside in the primary bow, and contrariwise in the secondary.

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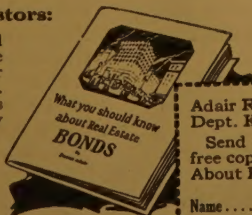
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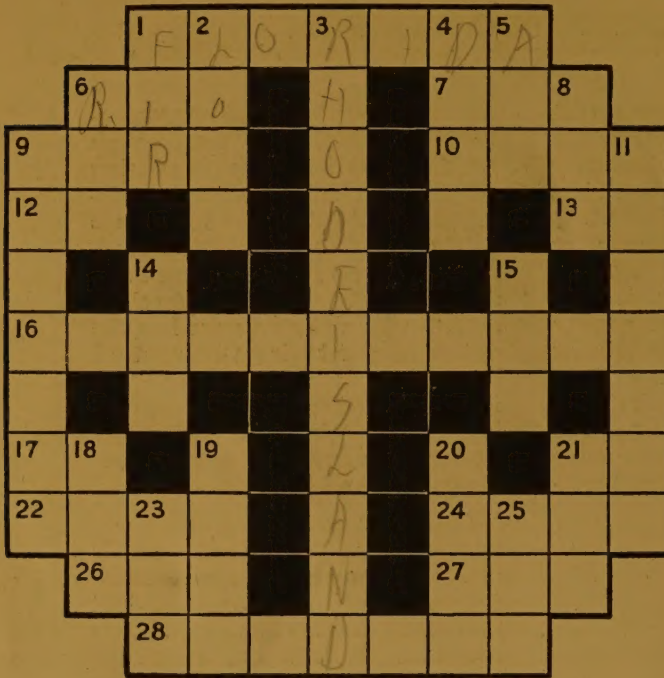
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AN UNCLE SAM CROSS-WORD PUZZLE

When You Have Worked Out This Puzzle You Will Have Learned a Number of Important Facts About the United States



ACROSS

1. The state in which was founded the first white settlement within the present bounds of the Union.
6. Part of the name of a boundary river in the south-western part of the United States famed in history, song and romance.
7. A distinguishing physical feature of Mt. McKinley and Mt. Whitney (abbr.).
9. Name of a European sovereign, unwilling patron of early voyages of discovery that led to the settlement of America (abbr.).
10. An attack, such as Indian marauders frequently made upon the stockades of the colonists.
12. Initials of a leader of the English settlement established on Roanoke Island in 1585. He and his companions were the first to carry tobacco to the British Isles.
13. Abbreviation familiarly used to designate an important group of states, part of the "Old Thirteen."
16. Prolific iron-bearing mountains in Minnesota. On their slopes the ore lies so near the surface that it is scooped up with steam shovels.
17. A territory surrendered to the United States by Mexico in 1846; the forty-seventh state to be admitted to the Union.
21. Initials meaning "the Union's feathered emblem."
22. A state bordering on the Mississippi River which

Answer will appear in September issue of The Mentor.

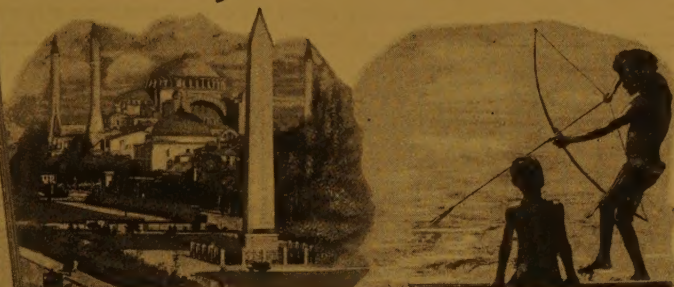
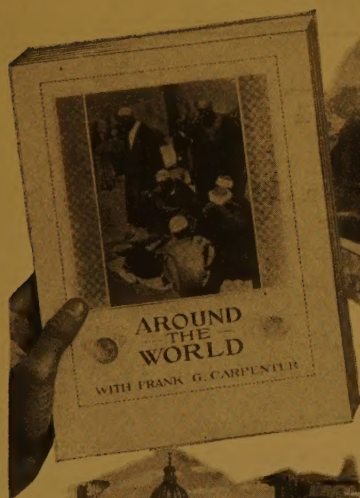
was originally named "the State of Franklin."

24. Part of the United States that offered refuge to English and Dutch colonists.
26. The number of the amendment to the Constitution which reads, "The powers not delegated to the United States by the Constitution, nor prohibited by it to the states, are reserved to the states respectively, or to the people."
27. No states have these letters as an initial.
28. Origin of the name "Vermont:" two French words used by Samuel Champlain to describe the Green Mountains. (The second word is plural and abbreviated.)

DOWN

1. A tree that grows to a great height in Pacific coast states.
2. A vein of precious metal. In connection with the name "Comstock," it refers to a fabulously rich deposit of gold and silver discovered in Nevada in 1859.
3. The most densely populated state; its flower is the violet, and its motto "Hope."
4. Surname of the first white child born on United States soil.
5. Last of the slaveholding states to be admitted before the passing of the "Missouri Compromise."
6. Initials of the great general who was called "the idol of the South."
8. A mineral product extensively mined in the Mid-Western States.
9. A gallant soldier-explorer who played a dramatic part in the establishment of the "Bear Flag Republic" in California in 1846.
11. Nickname of a Far Western commonwealth that was settled by a religious sect fleeing from persecution.
14. Oldest of the world's republics (initials).
15. Smallest of the Great Lakes (abbr.).
18. A significant word in the heroic message sent by Commodore Perry at the close of the Battle of Lake Erie.
19. English queen for whom the capital of Maryland was named.
20. A kind of sugar produced in large quantities in the state of Michigan.
21. Uncle Sam's exhortation to the citizens of the United States: "— your government."
23. The "Silver State."
25. Initials of the governor of the Empire State.

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THE OPEN LETTER



WE PRINT in this number an "Uncle Sam Crossword Puzzle." This was prepared especially to give Mentor readers a chance to try themselves out on their knowledge of the United States.

It may be interesting in this connection to note the extent to which our states, cities, towns and localities in general have figured in our plays.

When, some years ago, Augustus Thomas began his long and successful career as a playwright with that lovely idyl of Southern life, "Alabama," and then followed it up with "Arizona" and "In Mizzouri," a wit of the day made the remark that Mr. Thomas was on his way to "dramatize the map of the United States."

✦ ✦ ✦

Let us see how far the map of the United States has actually been dramatized. Way back in 1870 Augustin Daly produced "Saratoga," a play by Bronson Howard, then a young dramatist—and it ran one hundred nights. More than twenty years after, when Bronson Howard had come to be known as the "Dean of the Dramatic Profession," he produced a war play, of the "map" variety, entitled "Shenandoah"—and, for all we know, that popular piece may be running yet.

Somewhere in the 70's or early 80's James A. Herne made a play out of Long Island material, entitled "Sag Harbor," and not long after that "Way Down East" appeared.

About the same period Mr. A. C. Gunther produced dramatic versions of his two popular stories, "Mr. Barnes of New York" and "Mr. Potter of Texas." There was also a third, "Dr. Lanyon of Virginia," but we

need not dwell on this because it has been forgotten in the greater theme of Owen Wister's book and play, "The Virginian." And now we are to have Sabatini's "Carolinian" as a play.

Booth Tarkington's "Gentleman from Indiana" appeared in dramatic form, and a play of somewhat similar title was "The Gentleman from Mississippi," in which Tom Wise and Douglas Fairbanks were co-stars. This was long before Douglas Fairbanks became known to the world of moving pictures, and when he was glad to share honors with that genial comedian, Tom Wise.

Prominent among the "map" plays, of course, stands "The Heart of Maryland," in which David Belasco featured Mrs. Leslie Carter, and made a successful star of her. The name of Belasco, moreover, suggests another "map" play: "The Girl of the Golden West," which ran for several seasons and was finally turned into an opera by Puccini. The West is also pictured dramatically in William Vaughn Moody's "Great Divide." The Southland has its locale in the immortal "Uncle Tom's Cabin," but, strictly speaking, that does not belong in a list of "map" plays. We have, however, "Dixie" and "In Old Kentucky." Our big cities, of course, often figure in a general way in our plays, and the great metropolis of Manhattan has got into the dramatic picture countless times—very definitely in "The New York Idea," which Mrs. Fiske played for a season.

Have I overlooked any notable American "map" plays—I mean, plays with a definite locale and name?

W. D. Moffat

• Editor